



Geological Evolution of the United Arab Emirates

The Ministry of Energy and Industry initiated a new geological mapping program of the whole country in two large multidisciplinary projects. The first project which began in 2002 and ended in 2006 covered the mountainous and adjacent area and the second, started in 2008, covered the rest of the country and was completed in 2013. The projects involved the geological mapping of the entire country at varying scales from 1: 25 000 to 1: 100 000 and the acquisition of airborne magnetic, radiometric and gravity data in addition to deep seismic survey across the UAE-Oman Mountains. The geological studies included the complete series of analytical techniques including petrographic analysis of all rock types, geochemical and mineralogical studies, micro- and macro-paleontology and determination of the geochronology of events using various isotopic dating systems. The various analyses were carried out on numerous samples selected from the several thousand collected to unravel the complex geological evolution of the UAE. The geophysical surveys were enhanced by data from various sources within the UAE, such as the Abu Dhabi National Oil Company (ADNOC), Sharjah Petroleum Council and legacy seismic from other sources that were collated into models of the concealed deep geology of the UAE.

In the first project, the field data were collected on cards with each observation point located using a hand-held GPS, marked on plastic overlays above color aerial photographs and transferred to georeferenced Landsat images. These data were entered into a GIS system resulting in a fully digitally attributed geological map. From 2008 onwards the surveys and specialist studies were completed using a fully digital mapping system, involving direct field data collection on tablet computers with built-in GPS and using ArcGIS and MS Access software. In total, over 30, 000 observation points were made over the entire country. This activity has resulted in the UAE being one of the most comprehensively geologically surveyed countries in the world and one of very few to have a complete national, fully attributed, digital geological dataset.



In parallel with the geological mapping program, a number of sub-projects were undertaken to investigate the non-hydrocarbon economic mineral potential of the UAE. These included an assessment of high-purity carbonate reserves, a study of the “hard rock” geology (mainly ophiolitic rocks) currently quarried for aggregates supplying the wider Gulf region, possible future sources of dimension stone and the potential for platinum group elements (PGE) in the ophiolites. In addition, a number of focused applied geological projects were carried out such as the production of a three dimensional geological model of Abu Dhabi City, a seismic hazard map of the UAE and a synthesis of the country’s hydrogeology.

The vast body of data generated from the projects and sub-projects is available as published geological maps at scales from 1: 500 000 (the whole country on a single sheet) to 1: 25 000 with accompanying sheet explanations, memoirs and reports which are available from the Ministry. The data are also presented in digital form.

Towards the end of the project in the summer of 2012, the Ministry of Energy determined that the geological work should be made more widely accessible and synthesized in a single book, highlighting the geological evolution of the country and its magnificent geological heritage. As a result, a book representing the distillation of over a decade of geological endeavor in the UAE has been published. It aimed at a wide audience from geology undergraduates and academia in general to professional geologists and all those interested in the natural world. It does not give a systematic stratigraphic, formation-by-formation account of the geology, as such information is available in the various project memoirs and sheet descriptions; rather the book describes the dynamic geological evolution of the country during the over 800 million years of Earth history represented in this eastern part of Arabia.

The Ministry’s project outputs can be obtained through its website:

www.moei.gov.ae and in the Smart services : MENERGY .